(19) JAPANESE PATENT OFFICE

PATENT ABSTRACTS OF JAPAN

(11) Publication number: 02044929 A
(43) Date of publication of application: 14.02.1990

(51) Int. Cl H04B 7/26

(21) Application number: 63195800
(22) Date of filing: 05.08.1988

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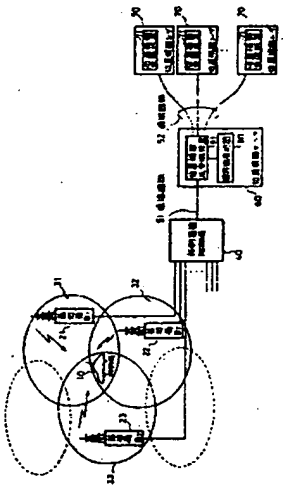
(54) MOBILE BODY POSITION DETECTION METHOD

(57) Abstract:

PURPOSE: To detect the position of a mobile body with high accuracy more than in the unit of radio zone without requiring large installation investment by collating a reception electric field level in a mobile station of a base station transmission wave with the level in an electric field strength map so as to detect the position of the mobile station in existence in an area.

CONSTITUTION: A mobile station 10 identifies and detects the reception electric field level of a base station transmission wave of a mobile body communication system for each of base stations 21-23, and the mobile station or a communication party to the mobile station 10 collates the level of an electric field strength map 90 whose position is made correspondent with the reception electric field level with the received electric field level to be detected for each of the base stations 21-23. Thus, the position of the mobile station 10 is detected more accurately than that in the radio unit zone of the mobile body communication system and the equipment required for the detention is simplified.



MACHINE-ASSISTED TRANSLATION (MAT):

(19) Japanese Patent Office (JP)
(12) Laid-open (kokai) patent application number (A)
(11) Patent-application disclosure Heisei 2-44929
(51)Int.Cl.5
H04B 7/26
Identification symbol 106
Internal adjustment number 7608-5K
(43) Disclosure February 14th, Heisei 2 (1990)
Request for examination UNREQUESTED The number of Claims 1 (total of 19 pages)
(54) TITLE The moving-body position detection method
(21) Application-for-patent number Showa 63-195800
(22) Filing date of application Showa 63 (1988) August 5th
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Specification

1. TITLE

The moving-body position detection method

2. Claim

1. Between a base station and a moving body in the moving-body position detection method in the mobile-communication system by the electromagnetic wave which is communicated, the electromagnetic wave from several above-mentioned base stations is respectively received by the above-mentioned moving body.

The range in which the above-mentioned moving body which corresponds to each receiving level using the coverage contour of the received electric-field level from each base station for which it required beforehand may exist is obtained.

An above-mentioned moving body's existence place is detected from the overlap of each range.

The moving-body position detection method which is characterised by the above-mentioned.

3. DETAILED DESCRIPTION OF INVENTION

[INDUSTRIAL APPLICATION]

This invention is utilised for a mobile-communication field.

This invention relates to the moving-body position detection method in mobile-communication systems, such as a vehicle-telephone system.

Especially, by comparing the received electric-field level and the field strength map in a mobile station of a base-station transmission wave, it relates to the moving-body position detection method that it was made to detect the position of the mobile station which exists in the area.

[PRIOR ART]

The current position of the mobile station which moves about a wide range is known in the mobile-communication systems which comprise entire area from several wireless zones, such as a vehicle-telephone system.

A circuit needs to be connected between a mobile station and a fixed network etc. That structure is made as below, and a vehicle-telephone system is made into an example and explained.

(System component)
The wireless area of a vehicle-telephone system consists of a mobile station 10, a base station 20, and a mobile-communication control station 40, as shown in Fig. 19.
A base station 20 takes charge of transfer of the wireless signal between mobile stations 10.
While the mobile-communication control station 40 controls several base stations 20, it takes charge of the interface with a fixed network.
<Zone component>
From reasons, such as the effective usage of limitation and frequency of the transmitting output of a mobile station 10, as shown in Fig. 20, a service area is divided in several wireless zones 30 in the vehicle-telephone system which performs the broad area service of a nation-wide scale with large scale.
A base station 20 is respectively installed in each wireless zone 30.
The identical frequency is repeated and been used between the base stations which an interference does not generate.
In order that a mobile station may perform a receiving-call service efficiently even wherever one is of a service area, a service area is divided in several areas in a vehicle-telephone system.
This area becomes as follows as a position identification unit (it calls location-registration area or simultaneous-paging area) of a mobile station. Whereabouts of each mobile station is registered into the alternator, and the system which calls only in the area in which a called mobile station is adopted. Location-registration area is congruous with the control zone mentioned later usually.
(Radio-channel component)
A mobile station is used several radio channels in common.
The each time specific radio channel of a call is chosen.
As shown in Fig. 20, the radio channel consists of the call channel 141 used for a call, and the control channel which uses the call channel 141 for the control suitably assigned depending on the call demand from a subscriber.
A control channel consists of the receiving-call control channel 142 used for the calling connection with a mobile station 10, and the simultaneous warning of control information, and the transmission control channel 143 used for a report and registration of the call connection and the mobile station 10 from a mobile station 10 of condition.
It becomes as follows as the arrangement method of a control channel.

(1) Arrange several wireless zones as one unit, i.e., a control zone.
That is, several wireless zones exist in each control zone.
A method to arrange the receiving-call control channel and the transmission control channel of the same number and an identical frequency on each wireless zone,
(2) Let several wireless zones be one unit (control zone) about a receiving-call control channel.
About a transmission control channel, it arranges for every wireless zone.
That is, about the receiving-call control channel, it is the same as that of the case of (1).
However, about a transmission control channel, there is the method of arranging a control channel depending on the control traffic of each wireless zone etc.
(1) And the transmitting-and-receiving system of the control signal in (2) is shown below.
In the case of (1)
About the control signal from a base station to a mobile station, a signal is simultaneously transmitted a originating-call / receiving-call control channel from all the base stations in a control zone.
This system is called "multiple station simultaneous-transmission system".
In the case of (2)
About the control signal from the base station of a transmission control channel to a mobile station, it is basically the same as that of the case of (1).
However, the control signal 150 from the base station of a receiving-call control channel to a mobile station has the signal (part which applied the oblique line in the figure) transmitted simultaneously, and the signal individually transmitted in order from each wireless zone from all the base stations in a control zone, as shown in Fig. 21.
These are always transmitted from the base station.
This system is called "multiple station simultaneous / sequential transmitting system".
In Fig, 21. 151 is a common information signal which passes control information common to all the wireless zones in a control zone. 152 is a receiving-call information signal which passes the receiving-call control information to a mobile station. 153 is a base-station information signal which passes an intrinsic information in each wireless zone.
All the base stations in a control zone transmit simultaneously the common

information signal 151 and the receiving-call control-information signal 152 all at once. However, each base station transmits the base-station information signal 153 in order.

The identification number of a base station etc. is included in the base-station information signal 153.

(Location registration)

Because of the connection of the call to the mobile station which moves about, or a calling, the detection of the current position of a mobile station is required.

It calls a location registration including the position detection for the fixation of simultaneous-paging area, and its registration.

The mobile station has stored the receiving-call control channel number (it corresponds to a frequency) which is used in the nation-wide control zone.

In waiting, selection receives the receiving-call control channel with the highest receiving level within these channels.

One's own control zone to locate is identified with the positional-information signal (control zone identification number) included there.

If the identification number after a switching differs from the identification number in front of a switching when a mobile station migrates the location-registration unit (namely, control zone) and switches over a receiving-call control channel, a location-registration signal will be transmitted to a wireless base station by the up circuit of a transmission control channel.

A location registration is performed.

(Decision of a mobile-station locating wireless zone)

In order to assign a call channel to a mobile station at the time of the calling to a mobile station, or the call from a mobile station, the locating wireless zone of a mobile station needs to be distinguished.

The fixation of a mobile-station locating wireless zone is performed by comparing the receiving level in the base station of the calling response signal of a mobile station, or the call signal from a mobile station in the vehicle-telephone system which has adopted the "multiple station simultaneous-transmission system".

The receiving level of the base-station information signal included in the control signal from the base station of a receiving-call control channel to a mobile station on the one side in the vehicle-telephone system which has adopted the "multiple station simultaneous / sequential transmitting system" is compared with a mobile station.

If it is personally locating in the zone of the wireless base station which has transmitted the base-station information signal passed most highly, when a mobile station judges, the fixation of a mobile-station locating wireless zone is performed.
As it is above, in order to connect a circuit between a mobile station and a fixed network in a vehicle-telephone system, by the base-station side, the position of a mobile station is always registered per control zone.
At the time of the transmission receiving-call call of a mobile station, in order to assign a call channel to a mobile station, it is identifying to the locating wireless zone of a mobile station.

[PROBLEM ADDRESSED]
However, since the ascertainment of a mobile-station location position is a wireless zone unit, the radius had the disadvantage with the identification accuracy of a position as rough as several to several-dozen kms. (The wireless zone in a vehicle-telephone system is about 3-15kms.)
Moreover, since the locating wireless zone of a mobile station was known only in the wireless area of a vehicle-telephone system, that the moving side subscriber itself or the stationary-side subscriber itself knows the locating zone of a mobile station, i.e., location position of a mobile station, had the impossible disadvantage.
Furthermore, by the growth of the social high informationising and the road traffic network supporting that in recent years, moving of a person and an object is activating. However, the road gets confusion every-day.
Since the range of movement is also broadened, the necessity for smooth moving of a person or a vehicle is increasing.
For this reason, a positional information is passed by the wireless from a sign post.
Development of the AVM system (Automatic Vehicle Monitoring System) aiming at always understanding the position of a moving body and increasing the efficiency of operation of a vehicle, GPS (Global Positioning System) which performs the position detection of a moving body using a satellite is also furthered.
In these systems, although the accuracy of a position detection was comparatively as high as several dozen meters, there was a disadvantage that capital investments, such as installation of a sign post or a launch of a satellite,

were required, in addition to the terminal at the side of a moving body.
The objective of this invention can detect the position of the moving body which exists in the area of a mobile-communication system, without needing a large capital investment, with high precision from a wireless zone unit by removing an above-mentioned disadvantage.
Furthermore it is in offering the moving-body detection method that the position of a moving body is detectable also in a moving body or its communication other party.

[SOLUTION OF PROBLEMS]

This invention respectively receives the electromagnetic wave from several above-mentioned base stations by the above-mentioned moving body between a base station and a moving body in the moving-body position detection method in the mobile-communication system by the electromagnetic wave to communicate.
The range in which the above-mentioned moving body which corresponds to each receiving level using the coverage contour of the received electric-field level from each base station for which it required beforehand may exist is obtained.
It is characterised by detecting an above-mentioned moving body's existence position from the overlap of each range.

[Effect]

Hereafter, the principle of this invention is explained.
The electromagnetic wave transmitted from the base station becomes weak as it goes away from a base station.
Therefore, if known, the strength, i.e., received electric-field level, of an electromagnetic wave received with a mobile station, it can estimate in general how much a mobile station exists in a separated position from a base station.
The topography around a base station is not similar. Since various objects, such as trees and a building, exist, the equal electric-field line of a mobile-station received electromagnetic wave is not the concentric circle centring around a base station generally.
However, if a degree electric-field line can be drawn by a certain method, it will exist in somewhere on the equal electric-field line with a mobile station equivalent to a received electric-field level.

Since a direction is not known only by receiving the electromagnetic wave of one base station, the position of a mobile station is known only somewhere on the equal electric-field line of the perimeter of a base station.

However, as shown in Fig. 1, the wireless zone of B1 (21), B2 (22) and B3 of the base station of three (23) has overlapped.

If the received electric-field level of each base-station electromagnetic wave is detectable with a mobile station (10), it can seek the position of a mobile station (10) from the intersection of the equal electric-field line of each base-station electromagnetic wave.

As it is be considerably accompanied by difficulty, requiring for a usually exact degree electric-field line finely, the position of the detectable mobile station 10 is not the point. It had a certain width.

That is, when the electric-field line with an equal received electric-field level in the mobile station (10) of the transmitted electromagnetic wave of the base station B1 (21), B2 (22), and B3 (23) of three can be found as shown in a diagram as shown in the field strength map of Fig. 2, the received electric-field level of the base station B1 (21) in a mobile station (10) is 52dBmicro-v/m temporarily. The level of base-station B2 (22) becomes as follows, if the level of 45dBmicro-v/m and the base station B3 (23) is 41dBmicro-v/m. A mobile station (10) will exist in somewhere in parts enclosed with the bold line border of a diagram.

If the number of the base stations which can receive in a mobile station (10) increases, it is also possible to narrow down the mobile station's (10)'s existence range more.

If the field strength map which drew the exact degree electric-field line finely is obtained, the position of a mobile station (10) can be detected further accurately.

This invention becomes as follows based on the above-mentioned idea.

(1) Respectively identify the electromagnetic wave from several transmitting points by the moving body, and receive.

(2) Seek the field strength map describing the coverage contour of a received electric-field level in the moving body of the electromagnetic wave from a transmitting point beforehand for every transmitting point.

(3) Perform comparison of the received electric-field level and the field strength map in a moving body about several transmitting points.

The position of a moving body is detected from overlapping of the range in which

the moving body which can be found on each field strength map may exist.
A field strength map is stored in the memory area of an information processor.
A process can be performed with program control.
(4) As a method which the electromagnetic wave from several transmitting points is respectively identified by the moving body, and is received, a service area consists of several wireless zones.
A wireless base station is respectively installed in each wireless zone.
The received electric-field level of the control signal which a base-station number and its base station transmitted within the control signal from a base station to a mobile station with the mobile station in the mobile-communication system which individually transmits the control signal to a mobile station with a base-station number sequentially from each base station is detected from a base station.
Or, the control signal to a mobile station sequentially switches over the radio channel received with a mobile station from each base station when individually not being transmitted with the base-station number sequentially from a base station.
While detecting the received electric-field level for every radio channel, the received electric-field level for every base station in a mobile station is detected by matching the base station which has transmitted the signal of a radio channel and its radio channel.
(5) Install the field strength map for every base station to the communication other party of a mobile station, a base station, or a mobile station in the above-mentioned mobile-communication system of (4).
A communication circuit is passed through and the base-station number which the position of the locality in a mobile station was detected from the base-station number detected with the mobile station and the received electric-field level of that base-station transmission wave, or was detected with the mobile station, and the received electric-field level of that base-station transmission wave are forwarded to the communication other party of a base station or a mobile station.
The received electric-field level and the field strength map for every base station in a mobile station are compared by the forwarding destination, and the position of a mobile station is detected.

[Example]

Hereafter, the example of this invention is explained with reference to a drawing.
Fig. 3 is a block diagram showing the mobile-communication system by the first

example of this invention.

This first example is with a mobile station 10, the base station B121 which has the wireless zone 31, the base station B222 which has the wireless zone 32, and the base station B323 which has the wireless zone 33. The positional-information centre 60 which has the positional-information transmitting-and-receiving apparatus 61 and the field strength map 90 which were connected by several wireless zones shown with other broken lines, the mobile-communication control station 40 which performs these controls, this mobile-communication control station 40, and the first communication circuit 51, and this positional-information centre 60, the second communication circuit 52 respectively connects these. Several positional-information users 70 who have the positional-information receiver 71 are included.

And, a mobile station 10 exists in the wireless zone 31 of a base station B121. The wireless zone 32 of a base station B222, the wireless zone 33 of a base station B323, etc. have overlapped with the wireless zone 31.

In a mobile station 10, transmission waves, such as base stations B121, B222, and B323, are receivable.

A mobile station 10 is connected to the positional-information centre 60 via a base station B121, the mobile-communication control station 40, and the first communication circuit 50.

Moreover, a field strength map 90 is the same content as that which was shown in Fig. 2.

In addition, the first communication circuit 51 is usually a fixed telephone circuit. However, it may be a bucket communication circuit, ISDN circuit, a mobile-communication circuit, etc. by changing the interface conditions of the mobile-communication control station 40 and the first communication circuit 51.

Even if the second communication circuits 52 are the first communication circuit 51 and a circuit of an identical variety, they may be different.

A various communication circuit can be considered as the first communication circuit 51.

As the base-station information signal 80 containing the base-station number 81 which is shown in Fig. 4 from each base stations B121, B222, and B323 shows Fig. 5 (a) - (d), it is individually transmitted sequentially from each base stations B121, B222, and B323.

The signal which is shown in Fig. 6 is received in a mobile station 10.

The detailed block diagram of a mobile station 10 is shown in Fig. 7.

The mobile station 10 includes an antenna 11, the moving apparatus 12, the telephone apparatus 13, the positional-information signal-detection device 14, the signal array sending-out device 15, and the modem 16.
The positional-information signal-detection device 14 receives the demodulation signal and the detection output of the base-station information signal 80 to a mobile station 10 from a base station from a moving apparatus 12.
From that, the received electric-field level of a base-station number and the base-station information signal which that base station transmitted is detected.
The base-station number 81 and a received electric-field level are sent out to the signal array sending-out device 15.
The signal array sending-out device 15 sends the mobile-station number, the positional information 81, i.e., base-station number, and the received electric-field level of a mobile station 10 to a modem 16.
A modem 16 modulates the data signal of the signal array sending-out device 15, and sends it out to a moving apparatus 12.
When a mobile station 10 has a demand of positional-information sending out from the positional-information centre 60, Or, when a positional information will be sent out from a mobile station 10 to the positional-information centre 60, in the base-station number 81 and the mobile stations 10, such as the positional information 222 detected with the mobile station 10, i, e., base-station B121B, and B323. A received electric-field level and a mobile-station 10 itself mobile-station number, A mobile station 10 is called from the positional-information centre 60. Or, the first communication circuit 51 which performs whether the positional-information centre 60 is called from a mobile station 10, and was set up between the mobile station 10 and the positional-information centre 60 is passed through, and it sends to the positional-information centre 60 from a mobile station 10.
The positional-information transmitting-and-receiving apparatus 61 receives the mobile-station number and the positional information which have been sent from the mobile station 10 in the positional-information centre 60.
Comparison with a positional information and the field strength map 90 is performed.
The position of a mobile station 10 is decided.
Finally, the positional-information centre 60 is directed to the positional-information receiver 71 of the positional-information user 70 who has required the positional information of a mobile station 10.

From the positional-information transmitting-and-receiving apparatus 61, the second communication circuit 52 is passed through and a mobile-station number and a mobile-station position are sent out.

Incidentally, in the component of the mobile station 10 of Fig. 7, originally, because the moving apparatus 12 has the detector of a control signal and a received electric-field level, it can give the same means as the above except a modem 16 to a mobile station 10 by changing the software of a moving apparatus 12.

In this case the positional-information signal-detection device 14 and the signal array sending-out device 15 become unnecessary.

Moreover, a modem 16 will also become unnecessary if the control channel is used for sending a mobile-station number and a positional information to a base-station side.

Fig. 8 is a block diagram showing the principal part of the mobile-communication system by the second example of this invention. Fig. 9 is a block diagram showing the detail of that mobile station.

This second example is that which the field strength map 90 was removed from the positional-information centre 60, and was provided in mobile-station 10a in the first example of Fig. 3, and others are the same as that of the first example.

In this second example, a position detection is performed by mobile-station 10a, and result is utilised by the mobile-station 10a side.

Moreover, the position detection result in mobile-station 10a is sent to the mobile-communication control station 40, the positional-information centre 60, or the positional-information user 70 with a mobile-station number.

Figs. 10 and 11 are respectively block diagrams showing the principal part of the mobile-communication system by the third example of this invention, and the fourth example.

This third example and this fourth example remove a field strength map 90 from the positional-information centre 60 in the first example of Fig. 3.

It is that which was respectively provided in mobile-communication control-station 40a and positional-information user 70a, and others are the same as that of the first example.

In this third example and the fourth example, the positional information sent from the mobile station 10 is used.

A position detection is respectively performed by mobile-communication control-station 40a and positional-information user 70a.

Fig. 12 is a block diagram showing the mobile-communication system by the fifth example of this invention. Fig. 13 is an explanatory drawing an example of that channel table. And Fig. 14 is a block diagram showing the detail of that mobile station.

This fifth example provides the channel table 100 with a field strength map 90 as positional-information centre 60a in the first example of Fig. 3.

Corresponding to that, the receiver 17 and the memory 18 are provided as mobile-station 10b.

In the first example or the fourth example, the base-station information signal containing a base-station number is individually transmitted sequentially from each base station.

The mobile station showed the example when the receiving level for every base station is detectable only by receiving a base-station information signal.

However, this fifth example is a thing using the method of identifying and detecting the receiving level for every base station to a mobile station when such a signal is not transmitted from the base station, and the base-station information signal containing a base-station number is not individually transmitted sequentially from each base stations B121, B222, and B323.

Here, the channel table 100 includes the channel number 101 and the base-station number 102 which matched the base station which is used a call channel and its call channel as shown in Fig. 13.

In Fig. 12, the channel number 101 of the call channel which a signal passes, and the received electric-field level in mobile-station 10b of that channel are stored in the memory 18 by mobile-station 10b, sequentially switching over a call channel, during waiting.

When mobile-station 10b has a demand of positional-information sending out from positional-information centre 60a, Or when a positional information will be sent out from mobile-station 10b to mobile-station information centre 60a, Positional-information centre 60a calls the mobile-station number of the received electric-field level and the mobile-station 10b itself in mobile-station 10b of its channel, the positional information 101, i.e., call channel number, detected by mobile-station 10b, mobile-station 10b. Or, the first communication circuit 51 which performs whether mobile-station 10b to positional-information centre 60a is called, and was set up between mobile-station 10b and positional-information centre 60a is passed through, and it sends to positional-information centre 60a from mobile-station 10b.

The positional-information transmitting-and-receiving apparatus 61 receives the mobile-station number and the positional information which have been sent from mobile-station 10b in positional-information centre 60a.
Comparison with the call channel number 101 in a positional information and the channel table 100 is performed.
The identification of the base station which is used that channel from the call channel number 101 is performed.
By this, the received electric-field level in a base station and the mobile station of that base-station transmission wave becomes clearly.
Next, comparison with the received electric-field level and the field strength map 90 in mobile-station 10b of each base-station transmission wave is performed.
The position of mobile-station 10b is decided.
Finally, positional-information centre 60a is directed to the positional-information receiver 71 of the positional-information user 70 who has required the positional information of mobile-station 10b.
The second communication circuit 52 is passed through and sent out from a mobile-station number and the mobile-station positional-information transmitting-and-receiving apparatus 61.
As mobile-station 10b in this fifth example is shown in Fig. 14, a receiver 17 has means to be used by the mobile-communication system of Fig. 12 and that a call channel is all receivable, including an antenna 11, the moving apparatus 12, the telephone apparatus 13, the signal array sending-out device 15, the modem 16, the receiver 17, and the memory 18.
Call channel, received electric-field level of that channel is sequentially detected a channel with a switching.
It sends out to a memory 18, doing the call channel number 101 and its received electric-field level as a positional information.
When a positional information needs to be sent out from mobile-station 10b, the signal array sending-out device 15 reads out a positional information 101, i.e., call channel number, and a received electric-field level from a memory 18, and sends it to a modem 16 with a mobile-station number.
A modem 16 performs the modulation of the data signal of the signal array sending-out device 15, and sends it out to a moving apparatus 12.
As the case of the first example or the fourth example, because the moving apparatus 12 has receiving means of all the radio channels of the mobile-communication system of Fig. 12, and the detector of a received electric-field

level, it can give the same means as the above except a modem 16 to mobile-station 10b by changing the software of a moving apparatus 12.
In this case a receiver 17, the memory 18, and the signal array sending-out device 15 become unnecessary.
Moreover, a modem 16 will also become unnecessary if the control channel is used for sending a mobile-station number and a positional information to a base-station side.
Where, the control of detecting suitably the received electric-field level of a call channel with a switching is required in a control channel and a call channel so that the calling to a moving apparatus 12 can be received, because a moving apparatus 12 cannot receive the signal of a control channel and a call channel simultaneously.
Incidentally, a call channel number and a base-station number can identify the base station which has transmitted the electromagnetic wave of that channel from a call channel number in the mobile-communication system which corresponds by one to one.
However, in the mobile-communication system which repeats a call channel in place and is used it such as the vehicle telephone, a base station cannot be specified only from a call channel number.
In such a case, a correspondence with a call channel and a base station can be attached by the following methods.
That is, in the component of Fig. 12, the channel designation signal 110 which is shown in Fig. 15 in the control signal to mobile-station 10b from a base station B121 is sent out in the case of the call from the calling or mobile-station 10b to mobile-station 10b.
In mobile-station 10b, a radio channel is switched over from a control channel to an appointed call channel according to this channel designation signal 110.
The mobile-station number 111 is required to confirm that it is the channel designation signal of a local toward.
The base-station number 112 puts this base-station number 112 in the circuit disconnect signal which transmits to mobile-station 10b, from the end-of-call signal which transmits to a base station B121 from mobile-station 10b, or the base station B121, when mobile-station 10b closes a call.
It is required, in order not to disconnect a circuit accidentally by being distinguishable from the end-of-call signal and the circuit disconnect signal to the call channel of a locality, even when it is used the radio channel of an

identical frequency, and also identical frequency interference receives the end-of-call signal and the circuit disconnect signal to a call channel of a wireless zone.

In the component of Fig. 12, as it is mobile-station 10b and it is shown in Fig. 15, the base-station number 112 is extracted from the channel designation signal 110.

The base-station number 112 is sent out to positional-information centre 60a with several call channel numbers which sequentially received the call channel with the switching, and the received electric-field level of that channel.

In positional-information centre 60a, instead of the channel table 100 of Fig, 13. It has the base-station table 120 on which the wireless zone 31 and the zone of a base station B121 can choose from the table 121 which is shown in Fig. 16, i.e., base-station number of a base station B121, the peripheral base stations B222 and B323 to which it is adjacent, and the base-station channel table 130 which matched the base-station number 132 and the call channel number 131 which are shown in Fig. 17.

In positional-information centre 60a, the base station B121, its peripheral base stations B222 and B323, etc. of the wireless zone 31 which mobile-station 10b is locating are chosen by comparing the base-station number 121 and the base-station table 120 of Fig. 16 which have been first sent from mobile-station 10b.

Subsequently, the base-station channel table 130 of Fig. 17 and the call channel number 131 sent from mobile-station 10b are compared.

The base station which is used that call channel is chosen from the call channel number 131.

However, because several base-station numbers correspond to one call channel number 131, the base station chosen in the front stage is chosen.

By the above-stated, the base station of the wireless zone which a call channel number and a mobile station are locating, and a correspondence, with that peripheral base station are attached.

The correspondence of a received electric-field level in the mobile station of a base-station number and its base-station transmission wave is attached.

Fig. 18 is a block diagram showing the detail of the mobile station by the sixth example of this invention.

This sixth example provides the position sensor 19 which has the field strength map 90 and the channel table 100 as mobile-station 10C, in the fifth example shown in Figs. 12 and 14.

In the fifth example, the field strength map 90 and the channel table 100 are put on positional-information centre 60a.
However, this sixth example puts these on mobile-station 10c, as shown in Fig. 15.
A position detection is performed by mobile-station 10C, and a result is utilised by the mobile-station side.
Moreover, the position detection result in mobile-station 10C is sent to the mobile-communication control station 40, the positional-information centre 60, or the positional-information user 70 with a mobile-station number.
In Fig. 18, a position sensor 19 extracts the call channel number 101 and a received electric-field level from a memory 18, when a positional information needs to be detected.
The position of mobile-station 10c is detected using the channel table 100 and the field strength map 90.
It sends to the signal array sending-out device 15.
In addition, in addition to this, the deformation of the fifth example is possible as the first example or the fourth example.

[Effect of the invention]
As explained above, this invention performs the identification detection of the received electric-field level of the base-station transmission wave of a mobile-communication system for every base station with a mobile station.
In the communication other party of a mobile station or a mobile station etc., the position of a moving body is with high precision detectable from the wireless zone unit of a mobile-communication system by comparing a received electric-field level, the field strength map to which made the position correspond, and the detected above-mentioned received electric-field level for every base station.
The above-mentioned effect is expectable.
Furthermore an installation required for this detection is simple, and finishes.
The above-mentioned effect is expectable.
4. Brief Explanation of the Drawings
Fig. 1 is an explanatory drawing the principle of this invention.
Fig. 2 shows an example of that field-strength part cloth diagram.
Fig. 3 is a block diagram showing the mobile-communication system by the first example of this invention.
Fig. 4 is an explanatory drawing the component of that base-station information

signal.

Fig. 5 (a) - (d) is the transmitting timing diagram of that base-station information signal.

Fig. 6 shows the base-station information signal which that mobile station receives.

Fig. 7 is a block diagram showing the detail of that mobile station.

Fig. 8 is a block diagram showing the principal part of the mobile-communication system by the second example of this invention.

Fig. 9 is a block diagram showing that mobile station a detail.

Fig. 10 is a block diagram showing the principal part of the mobile-communication system by the third example of this invention.

Fig. 11 is a block diagram showing the principal part of the mobile-communication system by the fourth example of this invention.

Fig. 12 is a block diagram showing the mobile-communication system by the fifth example of this invention.

Fig. 13 is an explanatory drawing the component of that channel table.

Fig. 14 is a block diagram showing the detail of that mobile station.

Fig. 15 is an explanatory drawing the component of that channel designation signal.

Fig. 16 is an explanatory drawing the component of that base-station table.

Fig. 17 is an explanatory drawing the component of that base-station channel table.

Fig. 18 is a block diagram showing the detail of the mobile station by the sixth example of this invention.

Fig. 19 is an explanatory drawing the component of the mobile-communication system by the prior art example.

Fig. 20 is an explanatory drawing of that radio-channel component.

Fig. 21 is an explanatory drawing the component of that control signal.

10, 10a, 10b, 10c *** mobile station, 11 *** antenna, 12 *** moving apparatus, 13 *** telephone apparatus, 14 *** positional-information detector, 15 *** signal array sending-out device, 16 *** modem, 17*** receiver, 18 *** memory, 19 *** position sensor, 20 *** base station, 21 *** base station B1, 22 *** base station B2, 23 *** base-station B, 30, 31, 32, 33 *** wireless zone, 40 *** mobile-communication control station, 50, 51, 52 *** communication circuit, 60, 60a *** positional-information centre, 61 *** positional-information transmitting-and-receiving apparatus, 70, 70a *** positional-information user, 71 *** positional-

information receiver,
80, 153 *** base-station information signal, 81, 102, 112, 121, 132 *** base-station number, 82 *** Other Information Signals, 90 *** field strength map, 100 *** channel table, 101, 113, 131 *** call channel number, 110 *** channel designation signal, 111 *** mobile-station number, 120 *** base-station table, 122 *** peripheral base-station number, 130 *** Base-station channel table, 141 *** call channel, 142 *** receiving-call control channel, 143 *** transmission control channel, 150 *** control signal, 151 *** common information signal, 152 *** receiving-call information signal.

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Principle explanatory drawing
Fig. 1
Electric-field lines, such as a base station B1 (level X)
Mobile station
Base station B1
The equal electric circuit of a base station B2 (level y)
Base station B2
Electric-field line levels, such as a base station B3
Base station B3
The received electric-field level in a mobile station
Base station
B1
Base station B2
Base station B3
Received electric-field level
Principle explanatory drawing (field strength map)
Fig. 2
Longitude on a map
Latitude on a map
(Base station B1) Wireless zone
Base station B1
Degree electric-field line
(Base station B2) Wireless zone

Base station B2
(Base station B3) Wireless zone
Base station B3
The component of the first example
Fig. 3
Base station B1
Base station B2
Base station B3
Mobile station
Mobile-communication control station
Communication circuit
Communication circuit
Positional-information transmitting-and-receiving apparatus
Field strength map
Positional-information centre
Positional-information receiver
Positional-information user
Positional-information receiver
Positional-information user
Positional-information receiver
Positional-information user
The first example (component of a base-station information signal)
Fig. 4
Base-station information signal
Base-station number
Other information signal
Fig. 5 First Example (Transmitting Timing of Base-Station Information Signal)
(a) Time series of the base-station information signal which a base station transmits
Level
Time
(b) The base-station information signal which 1 B transmits
Level
Time
(C) Base-station information signal which B2 game transmits
Level

Time
(d) The base-station information signal which Bn station transmits
Level
Time
B1: The base-station information signal from a base station B1 to a mobile station
B2: The base-station information signal from a base station B2 to a mobile station
Bn: The base-station information signal from a base station Bn to a mobile station
The first example (base-station information signal which a mobile station receives)
Fig. 6
Level
Time
The base-station information signal to the mobile station from the base stations B1, B2, and B3 received with a mobile station
The first example (component of a mobile station)
Fig. 7
Antenna
Mobile station
Moving apparatus
Telephone apparatus
Positional-information signal-detection device
Signal array sending-out device
Modem
The second-example component
Fig. 8
Base station B1
Base station B2
Base station B3
Field strength map
Mobile station
Mobile-communication control station
The second example (component of a mobile station)
Fig. 9

Antenna
Mobile station
Moving apparatus
Positional-information signal-detection device
Field strength map
Telephone apparatus
Modem
Signal array sending-out machine
The component of the third example
Fig. 10
Base station B1
Base station B2
Base station B3
Mobile station
Mobile-communication control station
Field strength map
The component of the fourth example
Fig. 11
Wireless zone
Base station
Mobile station
Mobile-communication control station
Communication
Circuit
Positional-information receiver
Field strength map
Positional-information user
Positional-information receiver
Field strength map
Positional-information user
Positional-information receiver
Field strength map
Positional-information user
The component of the fifth example
Fig. 12
Base station B1

Base station B2
Base station B3
Mobile station
Mobile-communication control station
Communication circuit
Positional-information transmitting-and-receiving apparatus
Field strength map
Channel table
Positional-information centre
Communication circuit
Positional-information receiver
Positional-information user
Positional-information receiver
Positional-information user
Positional-information receiver
Positional-information user
The fifth example (channel table)
Fig. 13
Call channel number
Base-station number
Channel table
The fifth example (component of a mobile station)
Fig. 14
Mobile station
Antenna
Moving apparatus
Telephone apparatus
Signal array sending-out machine
Modem
Receiver
Memory
The fifth example (component of a channel designation signal)
Fig. 15
Channel designation signal
Mobile-station address
Base-station number

Call channel number
The fifth example (base-station table)
Fig. 16
Base-station table
Base-station number
Peripheral base-station number
The fifth example (base-station channel table)
Fig. 17
Base-station channel table
Call channel number
Base-station number
The sixth example (component of a mobile station)
Fig. 18
Mobile station
Antenna
Moving apparatus
Telephone apparatus
Modem
Signal array sending-out machine
Receiver
Memory
Position detection
Channel table
Field strength map
Prior art example (component of a vehicle-telephone system wireless area)
Fig. 19
Mobile station
Base station
Mobile-communication control station
Fixed network
Prior art example (radio-channel component of a vehicle-telephone system)
Fig. 20
Mobile station
Base station
Prior art example (component of a control signal)
Fig. 21

Control signal
Common information signal
Receiving-call information signal
Base-station information signal
Receiving-call information signal
Base-station information signal
Receiving-call information signal

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